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People tend to be curious. On occasion they interest themselves in pursuit of knowledge which has an immediate material justification. Sometimes curiosity results in the search for answers ~~without forseeable uses for the information to be gleaned.~~ which have no forseeable physical application.

Many biologists have taken an interest in recent years in membranology. Understanding of the structure and function of biological membranes has, in some cases, brought immediate applications. Aspects of contact inhibition in tissue cultures has, for example, ~~elucidated~~ have given insight into the processes of cell division in healthy and carcinogenic cells.

Membranes are part and parcel of living systems. Without ~~pl~~ intact plasma membranes, the cytoplasm loses its compartmentation, is no longer sequestered from the external medium and loses its metabolic capacity. But compartmentation is only a small fraction of the biological functions of membranes. These include such varied tasks as electrical insulation in nerves, energy conversion in mitochondria and chloroplasts, and protein synthesis in the endoplasmic reticulum.

Another important function of membranes is regulation and control of molecules within the cell as opposed to without. Cell membranes actively engage in transporting solutes in and out of the cell, depending largely upon their

need. For example, many bacteria recognize the presence of metabolizable sugars and bring them into the cell in concentrations which can far exceed ~~that~~ those of the external medium. ¶ The general process of transport ~~is divided into~~ through the plasma membrane can be subdivided on transport which consumes metabolic energy, known as active transport, as opposed to diffusion through the membrane ~~where~~ the rate of may be facilitated, but which does not take place if energy is required. ~~As a result of~~

These differences provide a basis for differentiating between active and passive transport. Active transport can occur against osmotic gradients and is ~~un~~ inhibited by ~~or~~ energy uncouplers. Therefore to substantiate an active transport system, one must show that the ion or molecule in question is absorbed into the cell in higher concentrations than in the medium, without undergoing net chemical change. As well there must be evidence that energy uncoupling be breaks down this concentration gradient.

A number of active transport systems have been found in different membranes. Examples are Na^+ and K^+ in erythrocytes and sugars in certain bacteria.

One of the poorly understood transport systems is that of inorganic phosphate ~~in~~ ~~ba~~. Phosphate is a component of such vital biomolecules as DNA, RNA and ATP. Cells deprived of phosphate cannot survive. Moreover, some bacteria are able to store phosphate in intracellular ~~polymers~~ polyphosphate granules. One such bacteria is Micrococcus lysodeikticus.

Since all membranes have common features in morphology, ultrastructure and function, characterization of one active transport system & in the membrane system of one microorganism is likely to provide a basis for a more general greater understanding in the processes of phosphate uptake, both active, and passive, in general. Whether this knowledge will find medical or technological application is a moot point. However, there is a definite question connected with this research -- are the experimental means by which we attempt to characterize such systems ~~totally~~ reliable?

It can be demonstrated conclusively that radioactive phosphate is taken up by all cells, at varying rates. Cells of Micrococcus lysodeikticus which have been starved for phosphate show an initial rate of uptake five times that of unstarved cells.

It has also been demonstrated that the concentration of radioactive phosphate is much greater inside the cells than outside. Results of experiments in the fate of phosphate have been ambiguous. Even if it were to be determined that the inorganic phosphate brought into the cell was not metabolized, it is questionable whether we have broken down ~~from~~ some high energy intermediate and observed the inorganic phosphate as an artifact of breaking open the cell.

Membranes are known to have a major role in uptake since they can be extracted by various means and examined. Membrane fragments in solution tend to close to form ~~sacs~~ closed bags, or vesicles, apparently a thermodynamically stable configuration. Radioactive substrates added to the medium ~~can be examined~~ penetrate the membrane, are trapped inside and can be measured.

Experiments conducted with Micrococcus lysodeikticus membranes to show active transport of phosphate have been peculiar. ~~[illegible]~~ For active transport, it would be expected that the uptake of phosphate would show a time-dependent increase but the opposite is the case. There is a decrease in radioactivity with time.

It is difficult to either prove or disprove the hypothesis that the phosphate enters the ~~cell~~ interior vesicle as a high energy complex, which upon ~~leaving~~ entering the vesicular solution is freed and diffuses out of the vesicle.

There is ~~a~~ no point in doing "scientific research" if the researcher himself is ~~not fully convinced~~ content to doubt. that he is actually measuring what he thinks he is. On the other hand, the research is justified if the researcher can prove to himself that he is measuring either artifacts, or the real McCoy. If he is measuring artifacts, there is value in bringing his faulty means to the attention of scientists who may be using similar methods.

From meeting w/ Agasi 24/4/74.

Start off with why membranes are important - ask questions - give different answers, continue asking questions + answering them until you reach the question which goes at the beginning of the essay.

Compare synthetic membranes